

**Out of sight, out of mind**

**Dr. Philseok Kim (Program Director)**  
**Fast Pitch, 2022 ARPA-E Summit**  
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# Extreme weathers and power outages are increasing



Hurricane Ida, August, 2021, Louisiana, LA



Winter storm, March 2018, Natick, MA



Dixie Fire, 2021, Plumas County, CA



Tornado disaster, December, 2021, Mayfield, KY

**It's getting worse  
due to  
climate change**



**Wires and trees don't love each other**

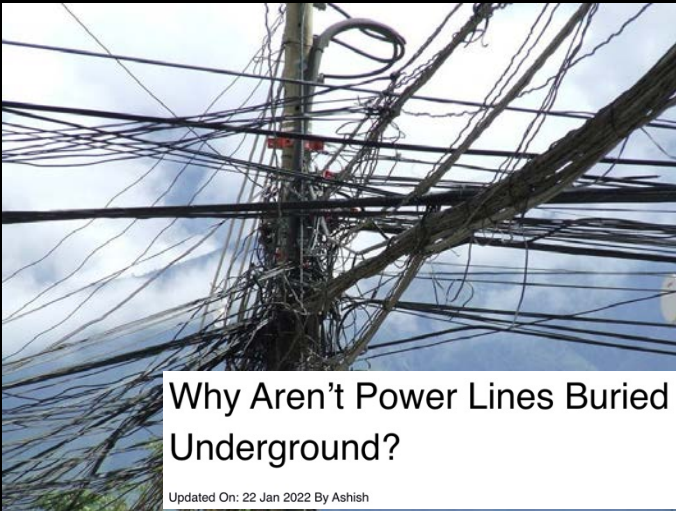
**Is pruning the trees  
really a sustainable  
solution?**

Image credit: Florida Power and Light, <https://simplytreesfl.com/power-lines-and-trees-are-not-friends>



# Why can't we just bury the wires?

By **Jennifer Fenn Lefferts** Globe Correspondent, March 30, 2018, <sup>1872</sup> **The Boston Globe** <sup>2022</sup>  
Serving our community for 150 years



## Why Aren't Power Lines Buried Underground?

Updated On: 22 Jan 2022 By Ashish

### POPULAR SCIENCE

## Why don't we put power lines underground?

The move could defend the grid against hurricanes. But it brings its own problems—and price tag.

BY ELEANOR CUMMINS | PUBLISHED JUN 7, 2018 1:15 AM

## Why doesn't New Jersey bury power lines underground?

**Katie Sobko**  
NorthJersey.com

1:38 p.m. ET March 9, 2018 | Updated 2:07 p.m. ET Aug. 6, 2020

# Why don't we bury the power lines?

by Wayne Stafford | Tuesday, May 18th 2021



## Electric users ask: Why not put power lines underground?

Matt Smith, CNN  
Updated 1:26 PM EST, Wed February 12, 2014



### NATIONAL

## If Power Lines Fall, Why Don't They Go Underground?

February 1, 2012 · 4:10 PM ET  
Heard on *All Things Considered*



## Does DTE bury the power lines?

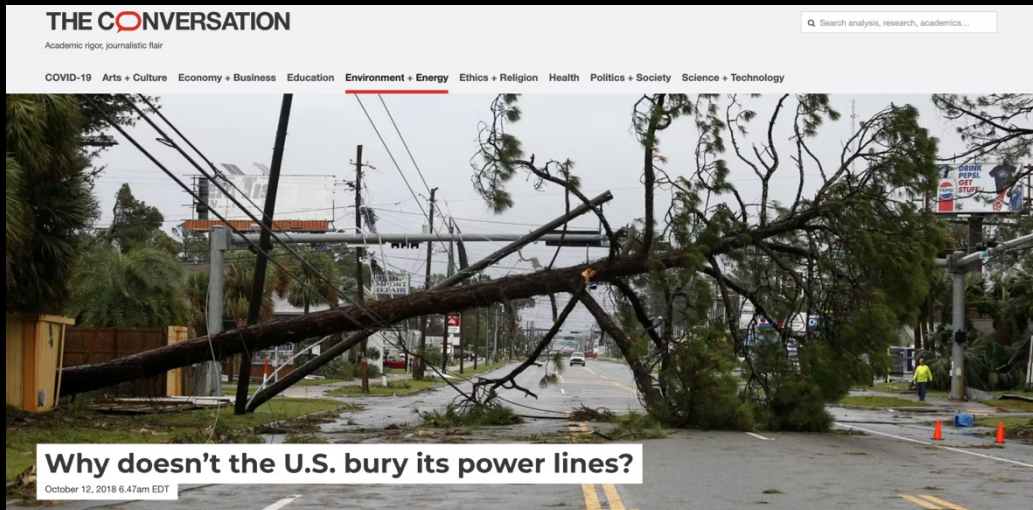
by Je'well Pearson | Oct 20, 2021

### Economic Policy

## Why most cities don't bury power lines

By Brad Plumer  
July 25, 2012

**The Washington Post**  
*Democracy Dies in Darkness*



## Why doesn't the U.S. bury its power lines?

October 12, 2018 6:47am EDT

## Why aren't power lines underground in Michigan?



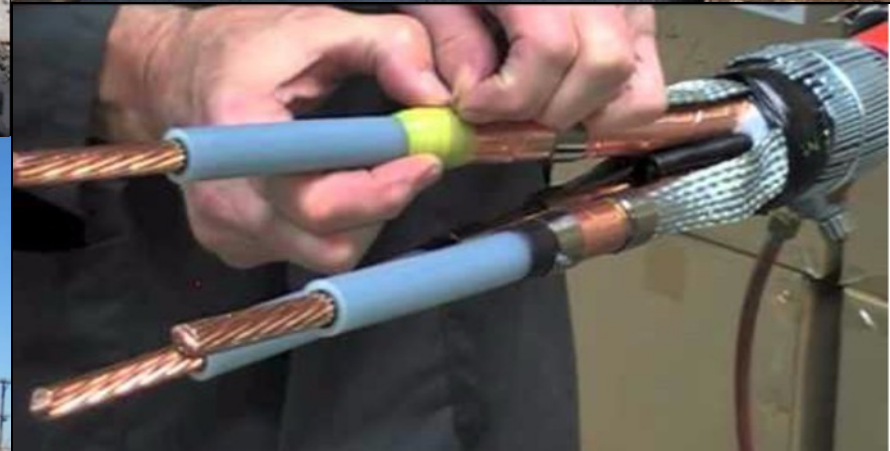
By Amber Ainsworth | Published August 12, 2021 | Michigan | FOX 2 Detroit



When Neighbors Ask  
Underground Power Lines











# **Why are we not burying the power lines?**

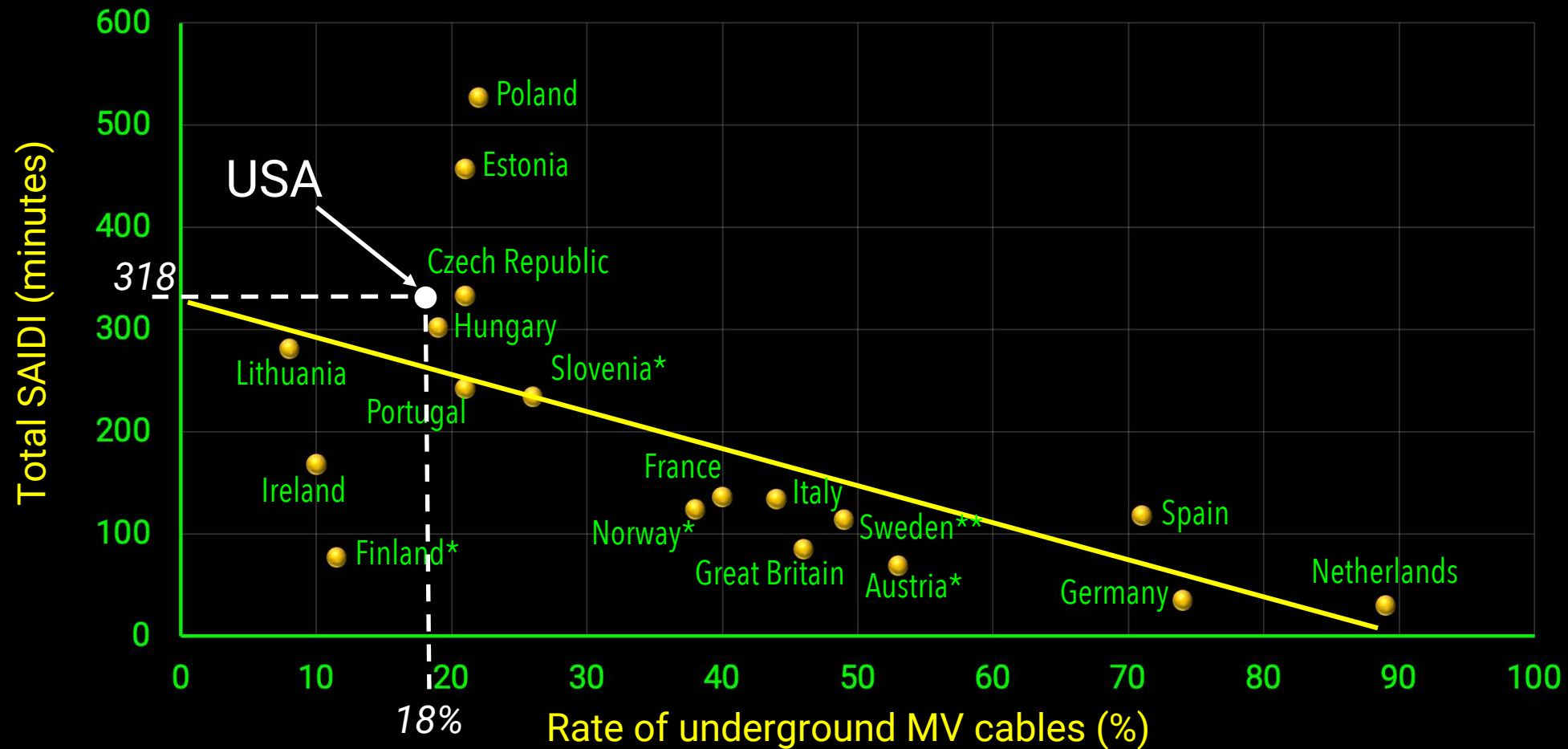
**up to 10x more expensive**

**difficult to repair and restore the power**



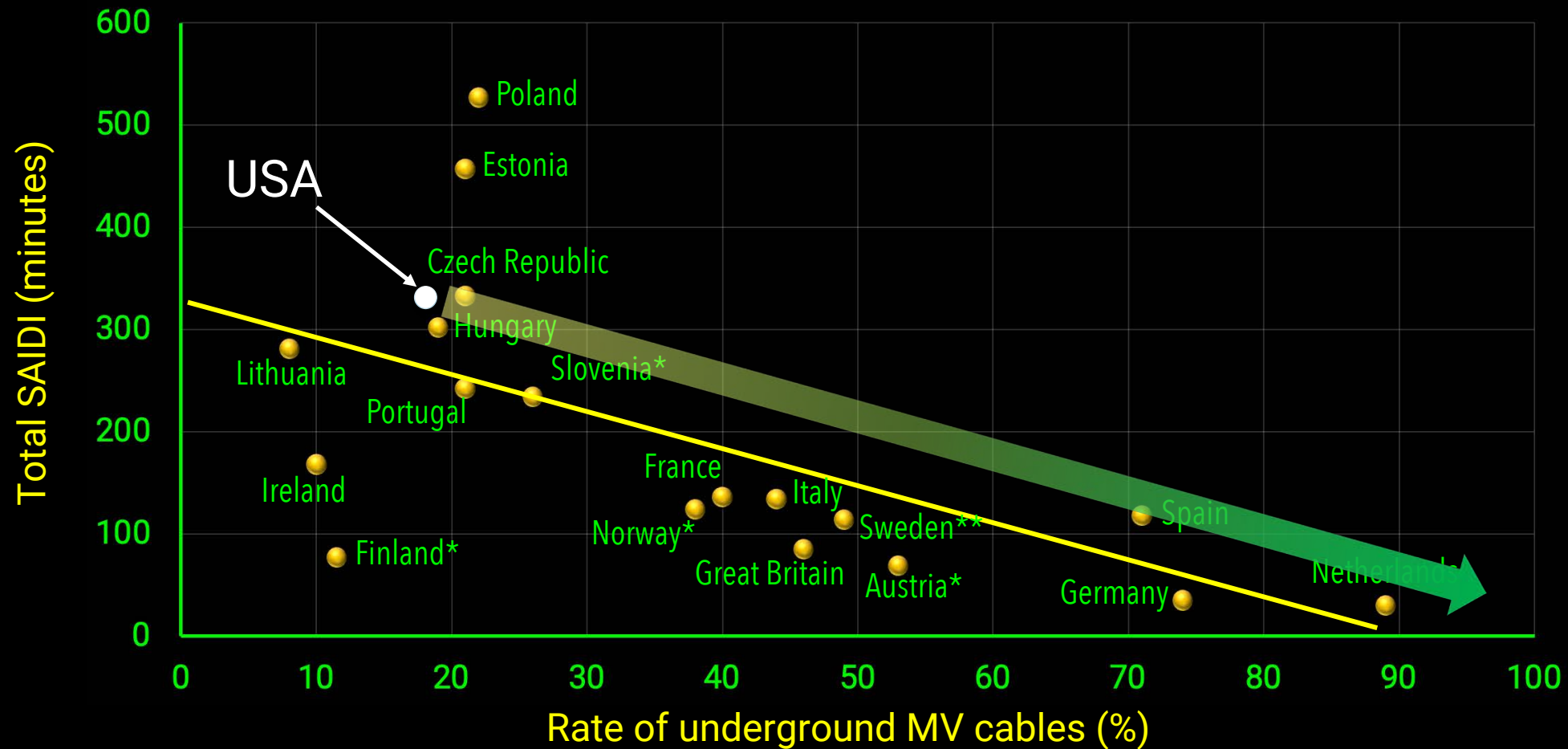
***may not fully solve the problem***

# Undergrounding power lines is a proven way to improve reliability



$$SAIDI = \frac{\text{sum of all customer interruption durations}}{\text{total no. of customers served}} \quad (\text{System Average Interruption Duration Index})$$

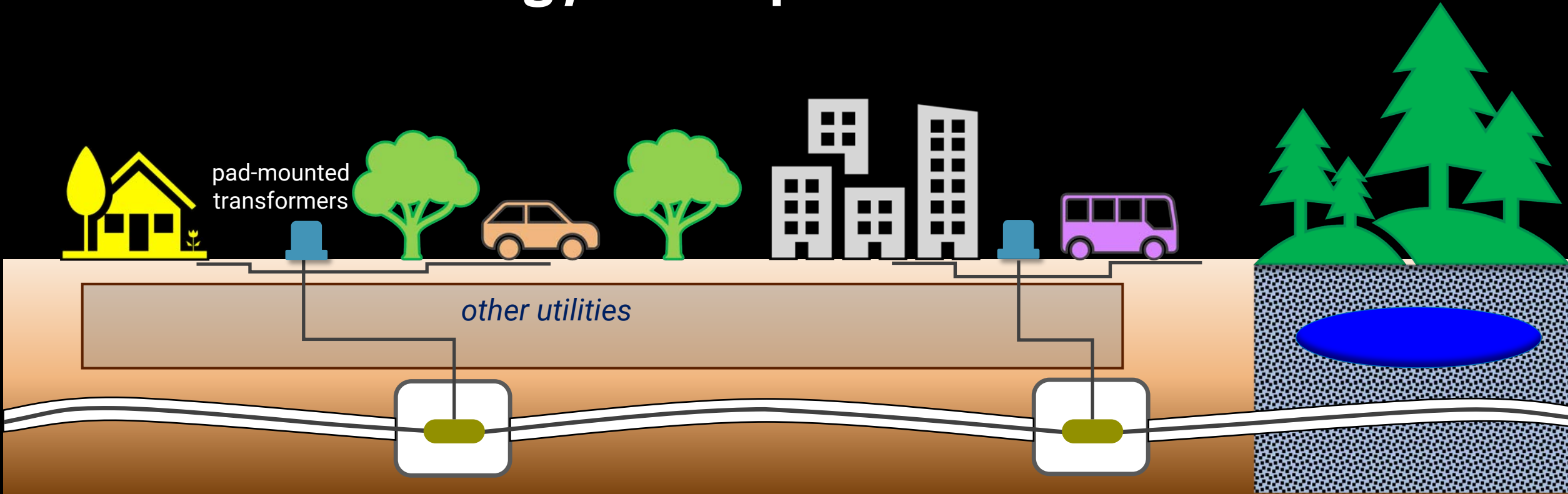
# Can we rethink underground construction and maintenance...



**to reduce cost and improve performance?**

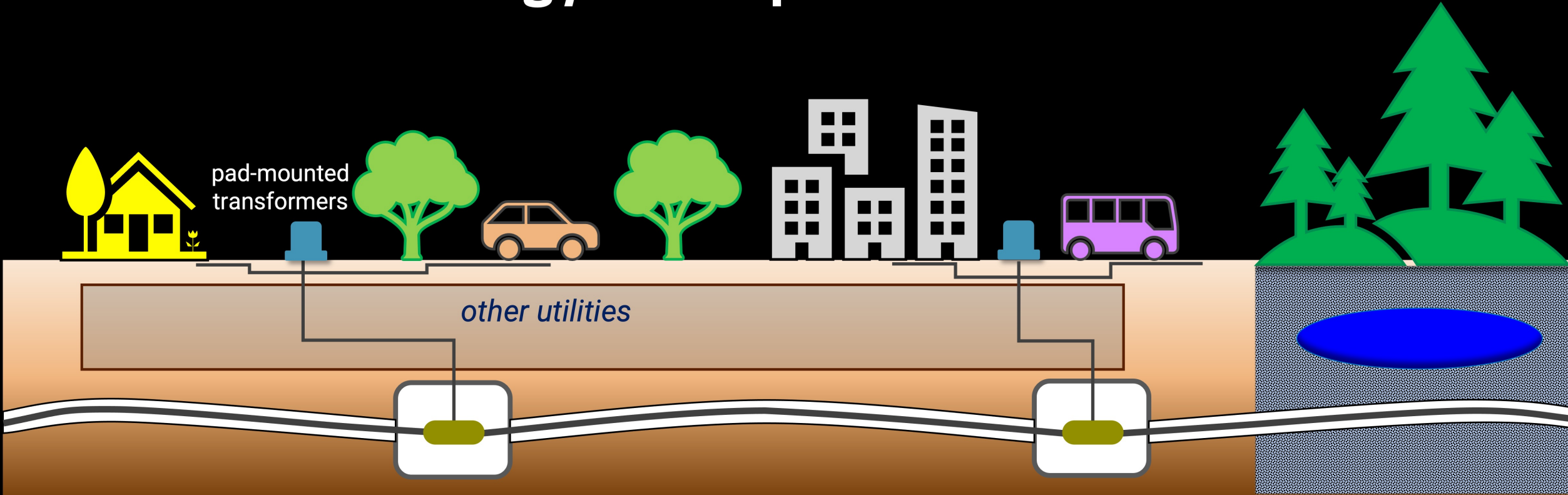


# Potential technology development areas

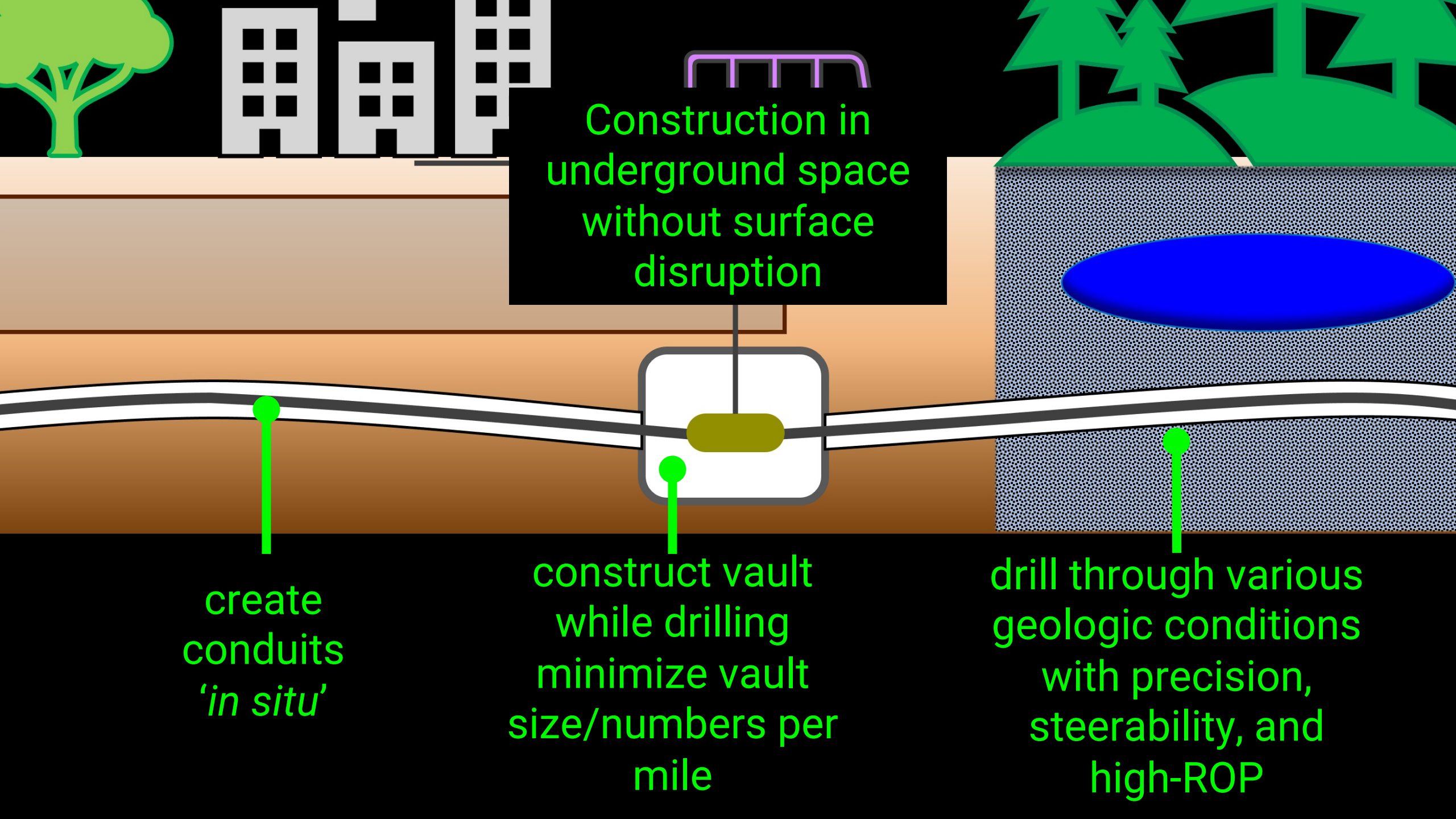




# Potential technology development areas







Construction in  
underground space  
without surface  
disruption

create  
conduits  
'in situ'

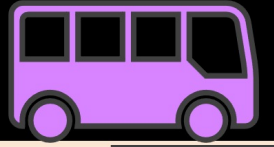
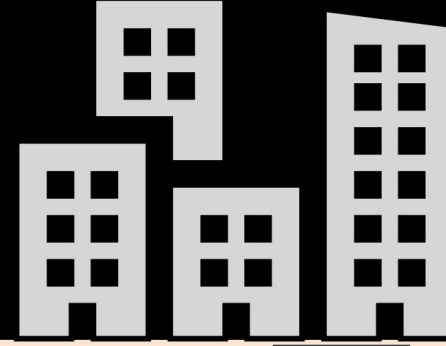
construct vault  
while drilling  
minimize vault  
size/numbers per  
mile

drill through various  
geologic conditions  
with precision,  
steerability, and  
high-ROP



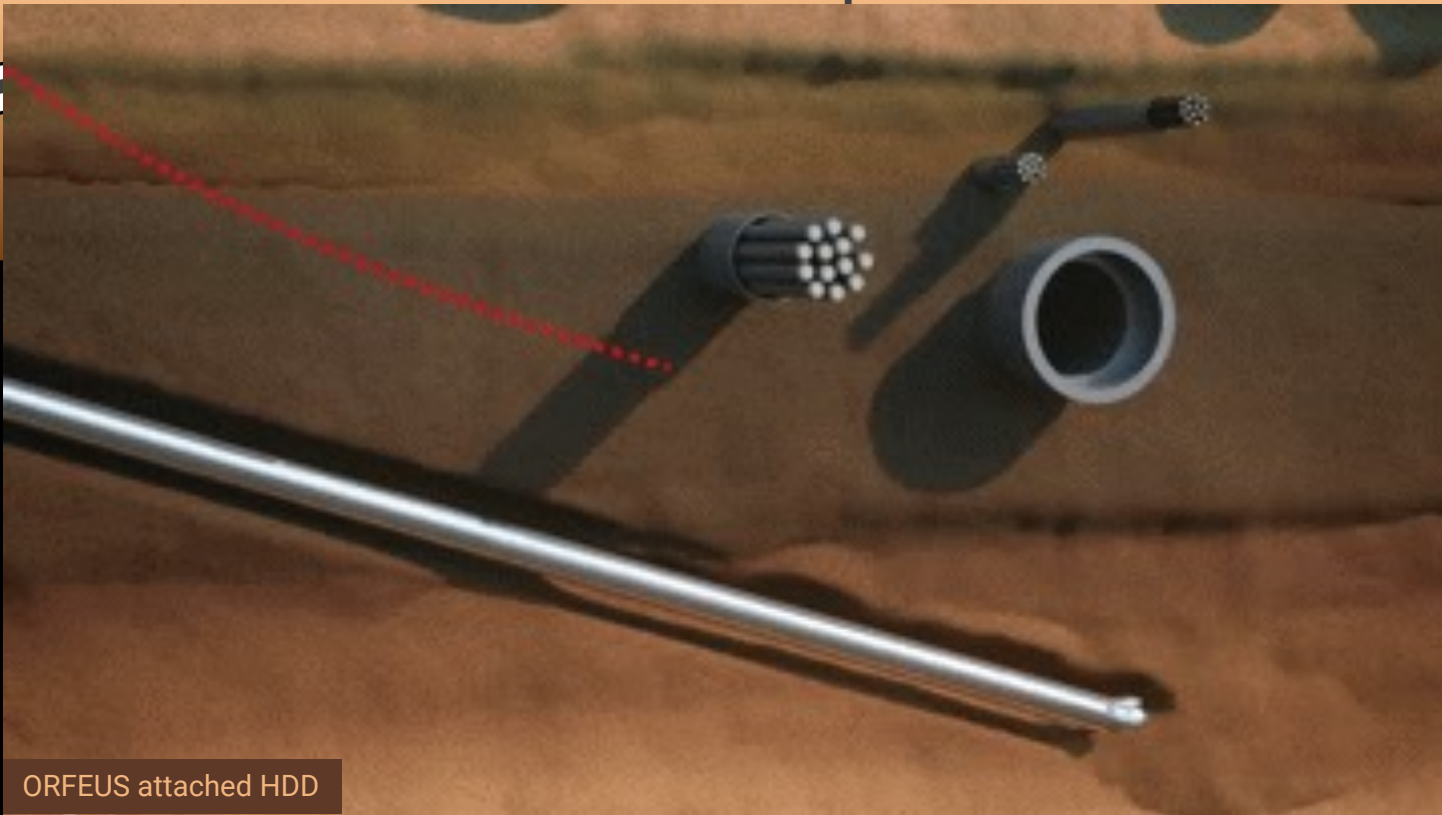


pad-mounted  
transformers

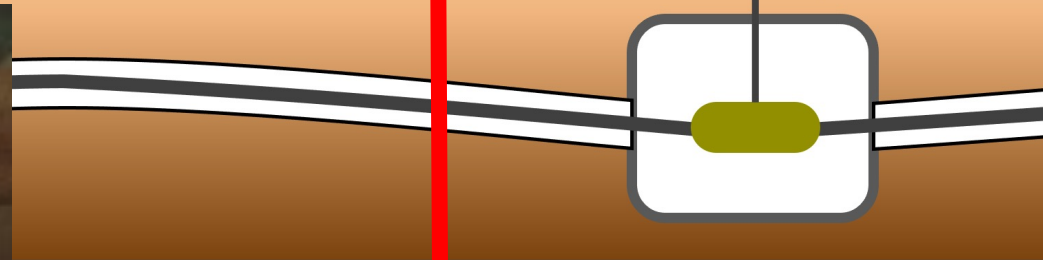


*other utilities*

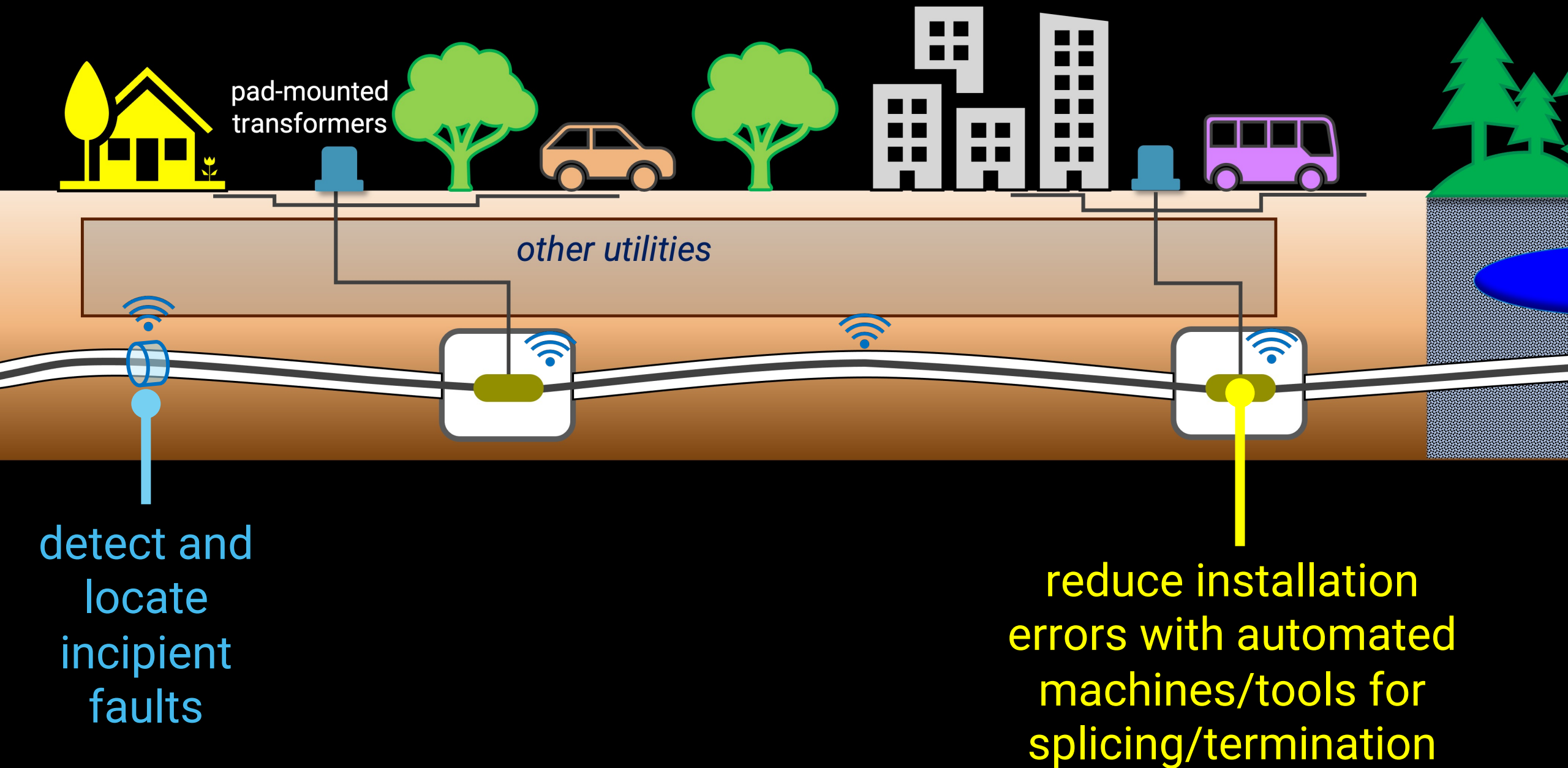
**obstacle avoidance**



ORFEUS attached HDD

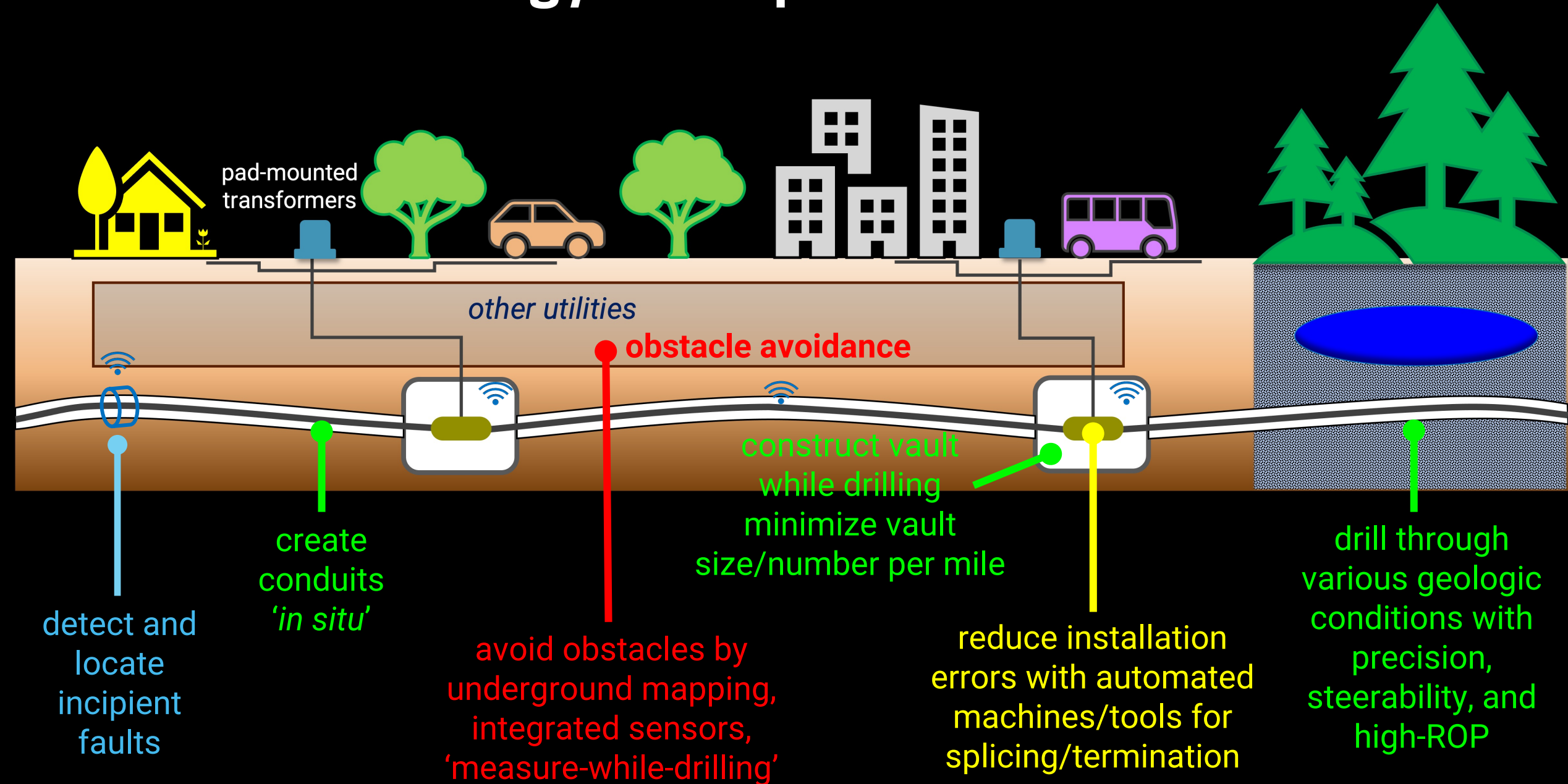


**avoid obstacles by  
underground mapping,  
integrated sensors,  
'measure-while-drilling'**





# Potential technology development areas



# No one has done this before...



- **Subtractive-additive underground construction with mapping**
- **Predict and locate fault well in advance of catastrophic failure**
- **Automated remote tools for safer, faster, more reliable splicing**



# **If it works, will it matter?**

- **Cost parity with overhead at same capacity**
- **SAIDI <30 min (world no. 1 level)**
- **No humans underground during and after construction**
  - **coffee with ARPA-E (7:45 – 8:45 am tomorrow)**
  - **[phil.kim@hq.doe.gov](mailto:phil.kim@hq.doe.gov)**